

Remarks

Favorable reconsideration of this application is respectfully requested.

I. Rejection of Claims 1, 3 and 4 under 35 U.S.C. §103 (a)

The rejection of Claims 1, 3 and 4 under 35 U.S.C. §103 (a) as unpatentable over Molero and U.S. Patent No. 6,295,575 to Epps et al. is traversed. It is respectfully submitted that Molero and Epps cannot be combined in the manner stated in the rejection, and, even if they could be combined, the combination would not produce the claimed invention.

Independent Claim 1 is directed to a method for use in a system for storing and accessing data, and recites, among other limitations:

the switch including a plurality of ports and a plurality of processing units, wherein each processing unit is associated with at least one port of said plurality of ports to provide load balancing at said at least one port . . .

for each request at said one or more ports, dynamically load balancing each request amongst the paths by using one or more processing units associated with said one or more ports to determine the appropriate path.
(*Emphasis added.*)

As previously pointed out in response to the last Office Action, and as is recognized by the Office, Molero does not disclose using “a plurality of processing units, wherein each processing unit is associated with at least one port of said plurality of ports to provide load balancing at said port”, as recited in Claim 1. In its rejection, the Office asserts, however, that Epps discloses a switching system utilizing a linecard pipelining scheme to service requests that arrive at switch ports and a plurality of processing units (CPUs), since each of the multiple linecards contains a CPU. As will be discussed below, this assertion is incorrect. Epps does not disclose anything about servicing “requests” in a storage network.

The Office further asserts that in the Epps system "the CPU on each line card dynamically load balances each request at the port" (Office Action, page 4). As a result, the Office concludes that it would have been obvious to incorporate the switch linecard pipelining scheme disclosed by Epps in Molero's system, and rejects the claims on this basis. As will also be discussed below, this is also incorrect, as Epps does not disclose anything about load balancing "requests".

Epps discloses a pipelined architecture employing data structures and registers for processing IP packet headers in order to route and switch IP packets in a data communications network. Epps is concerned with switching and routing IP packets, and discloses load balancing (superficially and peripherally without providing any details as to how load balancing is accomplished) only at a packet level. Thus, to the extent that Epps is even enabling with regard to load balancing, as required by 35 U.S.C. §112, ¶1 (which it is submitted Epps is not), the reference is solely concerned with load balancing individual IP packets in a data communications network router/switch.

In contrast, the invention is directed to load balancing storage input/output requests rather than individual packets. As previously pointed out, an input/output storage request in a storage network is significantly different from an IP packet in a data communications network; the specification distinguishes between IP packets and storage requests by teaching that a storage request comprises multiple packets. This specification indicates, for example, that:

In one embodiment, a request includes all packets sent back and forth from initiator to target until the request is complete, e.g., an iSCSI command PDU, an iSCSI R2T, an iSCSI write data PDU, and an iSCSI response PDU will form a single request. (*Specification paragraph [0109]*)

Epps deals only with individual IP packets in a data communications network, whereas the invention is concerned with storage requests comprising multiple packets that form a series of commands and responses exchanged between initiators and

targets. Epps does not disclose or suggest anything with respect to storage requests or to storage networks, and it is respectfully submitted that Epps is not an "analogous art" as asserted by the Office. The problems in dealing with storage requests are significantly different from those associated with IP packets because, unlike IP packets in a conventional data network communication system, dropping a request or a portion of a request in a storage system is unacceptable. Therefore, systems and approaches such as disclosed by Epps that are used in IP packet networks have little relevance to storage networks.

Molero, as recognized by the Office, discloses a system for storing and accessing data in a storage area network of the type to which the invention pertains. Molero deals with switching of I/O requests, not data packets. Epps, which relates to IP packet data processing, has little or no relevance to a switching system such as disclosed in Molero for handling I/O storage requests, and the teachings of Epps have little relevance to the switching system of Molero. Contrary to the Office's assertion, there is nothing in Molero or Epps that would suggest combining the systems of the two references. Epps operates at a packet level whereas Molero operates at a request level comprising multiple packets, and it is not even clear how one skilled in the art would combine the teachings of the two references, much less combine the teachings in a way that would render obvious Claim 1.

More particularly, the packet processing system of Epps receives incoming packets at a linecard of a switch/router, and processes the packet headers in a multi-stage pipeline to determine each packet's routing destination. Once that determination is made, each packet is modified to contain new routing information as well as additional header data to help speed it through the switch. The packet is then buffered and queued for transmission over the switching fabric to the line card attached to the proper destination port for the packet (*Epps, column 3, lines 10-30*). The multi-stage pipeline which operates on packet headers comprises a plurality of stages which are illustrated in Figure 4 and described at column 6, line 22 - column 7, line 4. These

pipeline stages comprise data structures including pointer and table lookups which make switching decisions and update appropriate fields in the IP header of a packet, and queue processed packets in an output buffer to be sent through the switch fabric to a destination linecard (*column 9, lines 5-14*).

Contrary to the Office's assertion, the CPUs on each linecard in Epps are not involved in load balancing. Rather, load balancing is performed in the table lookup unit (TLU) comprising a linked list of data structures (*column 12, lines 47-48, column 23, lines 15-34*) that provide offset values for different fields in the packet header to route the packet header to different locations. There is no disclosure in Epps of the linecard CPUs performing load balancing. Accordingly, there is no suggestion in Epps that a linecard CPU could be used for load balancing in the system of Molero.

Molero employs a centralized routing and arbitration unit for controlling an internal crossbar switch that randomly chooses among disks in the network for load balancing. It is not clear how one would even incorporate the linecard CPU of Epps into the system of Molero, as asserted by the Office. It is even more unclear how the pipeline architecture of Epps, which deals with packet headers could be usefully incorporated into the Molero system which deals with I/O requests. Moreover, even if the pipeline architecture of Epps were incorporated into Molero, the combination would not produce the claimed invention since the combination would not receive a plurality of storage input/output requests at one or more ports, and dynamically load balance each request among a plurality of paths using one or more processing units associated with said one or more ports, as claimed. Accordingly, it is respectfully submitted that Molero and Epps cannot be combined as asserted by the Office, and cannot in combination render the invention of Claim 1 obvious.

Claims 3 and 4, which depend from Claim 1 incorporate all the limitations of Claim 1, and likewise distinguish over the combination of Epps and Molero for the same reasons.